



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : E04G 23/00 // E01H 1/00		A1	(11) International Publication Number: WO 95/04203 (43) International Publication Date: 9 February 1995 (09.02.95)
<p>(21) International Application Number: PCT/DK94/00296</p> <p>(22) International Filing Date: 29 July 1994 (29.07.94)</p> <p>(30) Priority Data: 0890/93 30 July 1993 (30.07.93) DK 0917/93 9 August 1993 (09.08.93) DK</p> <p>(71) Applicant (<i>for all designated States except US</i>): KRISTIANSEN, Morten [DK/DK]; Krebseparken 66, DK-6710 Esbjerg V (DK).</p> <p>(71)/(72) Applicant and Inventor: DAMBERG, Finn [DK/DK]; Blomstervangen 11, DK-6800 Varde (DK).</p> <p>(74) Agent: LARSEN & BIRKEHOLM A/S SKANDINAVISK PATENTBUREAU; Shakengade 64, P.O. Box 200, DK-2630 Taastrup (DK).</p>		<p>(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), ES, FI, FI (Utility model), GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LT, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, SK (Utility model), TJ, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD).</p> <p>Published <i>With international search report. In English translation (filed in Danish).</i></p>	
<p>(54) Title: METHOD FOR SURFACE TREATMENT, MEANS FOR CARRYING OUT THE METHOD AND THE USE THEREOF</p> <p>(57) Abstract</p> <p>By using a method for the cleaning of facades and the like according to the invention by means of cleaning equipment mounted on a crane arm (7) by means of an adjustable head (11) which can be remotely-controlled for the precise positioning of the cleaning equipment (13, 15) in relation to the facade (12), and where the cleaning equipment can also be displaced laterally, cleaning can be carried out quickly and effectively without any unnecessary load on the environment, and completely without the need for operating personnel to be in the immediate vicinity of the actual point of cleaning. By using equipment comprising nozzles (15) and brushes (13), a hitherto-unknown high degree of cleaning efficiency is achieved due to the equipment's great path of movement. This makes the equipment according to the invention suitable for use in the cleaning of facades.</p>			
<p>The diagram illustrates a specialized cleaning vehicle, likely a truck or van, equipped with a long hydraulic crane arm (7) mounted on a platform. The crane arm is articulated at several points, including a main joint (8) and an adjustable head (11). The head is mounted on a horizontal beam (26) and is used to position cleaning equipment (13, 15) against a vertical facade (12). A person is shown standing on the ground, holding a hose (4) connected to the cleaning equipment. The vehicle has a cab (31) and a rear section with multiple wheels (27). The cleaning equipment (13, 15) is shown in two configurations: one with a nozzle (15) and another with a brush (13).</p>			

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METHOD FOR SURFACE TREATMENT, MEANS FOR CARRYING OUT THE METHOD AND THE USE THEREOF.

Background of the invention

5. The invention relates to a method for the treatment of surfaces, particularly facades, roofing and similar surfaces, by means of equipment for sluicing, brushing, sanding, sandblasting, chemical cleaning and similar processes, and where the equipment is mounted on an adjustable head with means for variable adjustment of the position of the equipment, and where the adjustable head is mounted on a lifting device, such as a crane, so that the lifting device can manoeuvre the equipment in relation to the surface, and means for the execution of the method and
10
15 the use thereof.

The cleaning of surfaces on buildings, technical installations such as masts, tanks and the like, is encumbered with great practical difficulties and
20 disadvantages, partly because of the need for equipment and partly because of the risk of detrimental influence on the working environment.

25 Facades can be cleaned by means of various methods such as high-pressure sluicing, rinsing, sandblasting and chemical cleaning.

These methods require equipment which needs to be operated by personnel who must remain in the close proximity of the point of processing. This is typically effected by working at a height from a crew platform which is mounted on a lifting device, so that the position of the platform and herewith the point of work can be adjusted in relation to the surface. The cleaning equipment can hereby be applied
30
35 to a given surface of limited extent, after which it must be moved with the personnel to a new place of work.

In order to improve the cleaning, it is known to mount cleaning equipment on the end of a crane, and herewith be able to remotely operate the equipment during the cleaning.

5 An example of this is known from German publication no. 24 10 925, comprising cleaning equipment in the form of a brush and nozzles which are mounted on the end of a crane jib. There is hereby achieved a certain degree of remote operation, but the cleaning capacity is limited by the fact
10 that the equipment must be moved and adjusted very precisely in relation to the surface in order for the cleaning to be effected in a uniformly efficient manner.

15 Furthermore, the equipment has a limited cleaning area, i.e. limited to the reach of the brushes and the nozzles over the surface.

20 In order to increase this processing area, it is known from Norwegian application no. 174,401 to configure the equipment with a nozzle head which can vary the direction of the jet in relation to the surface, in that the nozzle head can be moved in a given pattern on the crane jib. However, this method, which is known from tank cleaning, does not relieve
25 the problem with the relatively limited effect and capacity.

Also with this construction, the crane jib requires to be moved each time a given area has been cleaned.

30 Advantages of the invention

According to the invention, by using a method whereby the equipment can also be displaced laterally in relation to the adjustable head, a surprisingly simple method is achieved by which the known disadvantages are avoided, in
35 that the mobility of the cleaning equipment in the lateral direction increases the cleaning capacity in a simple

manner, and completely without the need of the crane jib having to be moved. This results in a considerable increase in the cleaning capacity, in that plane frontages can, for example, be cleaned either by a horizontal or a vertical 5 movement of the equipment for the whole of its path of movement before the crane or the adjustment head requires to be activated.

This results in a hitherto-unknown high effect and makes 10 the method extremely competitive.

As disclosed in claim 2, by using a rail on the adjusting head, and on this mounting a slide with nozzles which can move along the rail, the cleaning equipment can be moved 15 easily and precisely, possibly in a reciprocating movement over the surface.

As disclosed in claim 3, by providing the equipment with one or more rotating brushes, the cleaning effect is con- 20 siderably increased.

Finally, as disclosed in claim 4, it is expedient to use the method and the means for the cleaning of facades and similar surfaces.

25

The drawing

In the following section, example embodiments of the method, the means and their use according to the invention will be described in more detail with reference to the 30 drawing, where

fig. 1 shows the equipment in the form of a brush mounted on a crane arm for the cleaning of a facade,

35 fig. 2 shows the actual adjusting head with a brush and nozzles,

fig. 3 shows the actual adjusting head with a brush only,

fig. 4 shows the adjusting head with a rail and slide
with cleaning equipment in the form of nozzles,

5

fig. 5 shows the adjusting head with rail and slide,
where the cleaning equipment comprises a brush and
nozzles, and

10

fig. 6 shows the equipment mounted on a vehicle for the
cleaning of a facade.

Description of the example embodiments

15 In fig. 1 is shown an example of a processing equipment for
the cleaning of a surface which, in the example shown, is a
brick facade 12.

20 The equipment is built up as a unit comprising a container
1, on which the remaining equipment is mounted, so that the
equipment can easily be moved to the place of work.

25 The container 1 is provided with various arrangements such
as an accessories compartment 5, a tank compartment 3 and a
pump compartment 4. Naturally, any other division and
arrangement can be envisaged, e.g. where there is need for
sandblasting, chemical liquids etc., the equipment can be
configured accordingly.

30 At the top of the container there is shown a recess 2 for
the crane arm 7, 8, which in telescoped condition can be
placed in the channel. A compact configuration is hereby
achieved.

35 The crane 7 rests on a foot 6 and, in a commonly-known
manner, it is designed so that it can be extended and
turned. To the angle of the upper arm 9 there is mounted a

cylinder 8 in a commonly-known manner.

Finally, there is shown an operating box 10 which is connected via a cable to a program which via valves controls the individual movement arrangements, such as cylinders and drive motors, which will be explained later.

At the end of the arm 9, which constitutes the crane tip, there is shown an example of an adjusting head 11, and on this is mounted processing equipment in the form of a brush and nozzles.

In fig. 2, the adjusting head 11 and the processing equipment are shown in more detail.

The adjusting head 11 is secured to the end 9 of the lifting equipment by means of a fastening link 25 which ends in a vertically-extending bearing 23. The bearing 23 supports a fork 22 and a frame 19.

To swivel the frame 19 around the bearing 23 and maintain the position, there are mounted two cylinders 24 which are preferably hydraulically operated.

The frame 19 is U-shaped, as shown, and at the end there is housed a transverse gudgeon 20 which can be turned in the direction of the arrow by means of a rotary actuator 21.

On said gudgeon 20 there is mounted an output spindle 17, and this spindle can similarly be turned in the direction of the arrow by means of a rotary actuator 18.

As will appear from the drawing, the two axes of rotation extend at right-angles to each other, and in such a manner that the one extends through the centreline of the swivel link 23.

The two actuators 18, 21 are also preferably hydraulically operated.

5 The actual processing equipment is mounted on the output spindle 17. In the example shown in fig. 2, this comprises a U-shaped holder 16 having a bearing which supports a brush cylinder 13, in that said brush can be rotated by means of a hydraulic motor 28.

10 The brush 23 can be with or without sanding qualities, and can have a stiffness and dimension which are selected to suit the work currently to be carried out.

15 Additionally, there is mounted a nozzle holder 14 with nozzles 15 through which fluid under pressure can be conducted.

20 Where, for example, there is need for special treatment, whether this be of a chemical, thermal or surface-forming nature, separate fluids can be supplied to individual nozzles.

25 In fig. 3 is shown an example embodiment which shows equipment comprising a brush or sanding element 13 alone without nozzles.

30 To increase the mobility of the equipment, as shown in figs. 4 - 6, a slide rail 26 is mounted in the output spindle 17 on the adjusting head 11.

35 In the rail 26 there extends a chain drive 30 or the like which is in engagement with a slide 27 which slides on a pair of slide shoes 29 in such a manner that the slide 27 can be displaced along the rail 26. Nozzles 15 can be mounted on the slide 27 so that said nozzles can be moved in a path parallel with the rail 26.

As shown in fig. 5, instead of only mounting nozzles on the slide 27, a rotating brush 13 can be mounted in a holder on the slide 27, 29 which can slide on the rail 26. The brush can hereby be displaced on the rail for the cleaning of an
5 area corresponding to the length of the rail.

As shown in fig. 6, a surface 12 can thus be processed by the equipment on the rail 26, whereby the possibility is achieved for the processing of a relatively large area
10 solely due to the mobility of the nozzles.

The equipment's mode of operation will now be described.

15 The lifting equipment, e.g. the crane 7, is operated in a known manner either by the direct operation of the control valves or via a program which can be provided with pulses via a cable from a control box 10.

20 In a not-shown embodiment, sensors can be mounted on the slide for automatic distance measuring and adjustment of the equipment in relation to the surface to be processed. Consequently, a considerable increase in the cleaning capacity can be achieved with possibilities of a completely program-controlled cleaning.
25

The crane is supplied in a known manner with hydraulic oil for the working cylinders etc.

30 Hydraulic oil is supplied for the operation of the actuators 18, 21, 24, the brush unit 28 and the chain drive 30, and the regulation of this oil and herewith the actuation is carried out from the point of operation, which can be the control box 10. All functions can thus be
35 remotely controlled and possibly coordinated with the programming.

The supply of liquid to the nozzles 15 can take place via pipes from the pumps which, as shown in fig. 6, can be built into the unit on the vehicle 31 or, as shown in fig. 1, in a container 1.

5

As an example of the use of the equipment, it should be noted that where glass facades and other sensitive surfaces are to be cleaned, the feeding of the equipment and its effect can be adjusted for precisely this purpose.

10

The invention also makes it possible, for example, to process the hulls of ships, tank installations both internally and externally, masts and lattice constructions and the like, where by means of the equipment it is possible to position and adjust the equipment in accordance with the task to be carried out, and at a safe distance from the point of processing.

15

As mentioned, in addition to the actual cleaning, various agents such as impregnation agents, paint and the like, can subsequently be applied through nozzles using the paint-spraying principle.

20

The equipment can thus be adjusted to suit any task which calls for surface treatment in a precise manner, and at a distance from the point of processing.

25

30

C L A I M S

1. Method for the treatment of surfaces, particularly facades, roofing and similar surfaces, by means of equipment for sluicing, brushing, sanding, sandblasting, chemical cleaning and similar processes, and where the equipment is mounted on an adjustable head with means for variable adjustment of the position of the equipment, and where the adjustable head is mounted on a lifting device, such as a crane, so that the lifting device can manoeuvre the equipment in relation to the surface, characterized in that the equipment (13, 15) can also be displaced laterally in relation to the adjustable head (11).
15
2. Means for the execution of the method according to claim 1, characterized in that the equipment comprises one or more nozzles (15) which are mounted on a slide or carriage (27, 29) which can be moved along a rail or beam (26) which is mounted on the adjustable head (11).
20
3. Means according to claim 2, characterized in that the equipment further comprises one or more rotating brushes (13).
25
4. Use of the method and the means according to claims 1 - 3, characterized in that by the supplying of liquid under pressure to the nozzles (15), possibly supplemented with a brushing (13), surfaces can be cleaned, said cleaning being used for the cleaning of facades, roofing and similar surfaces.
30

1/6

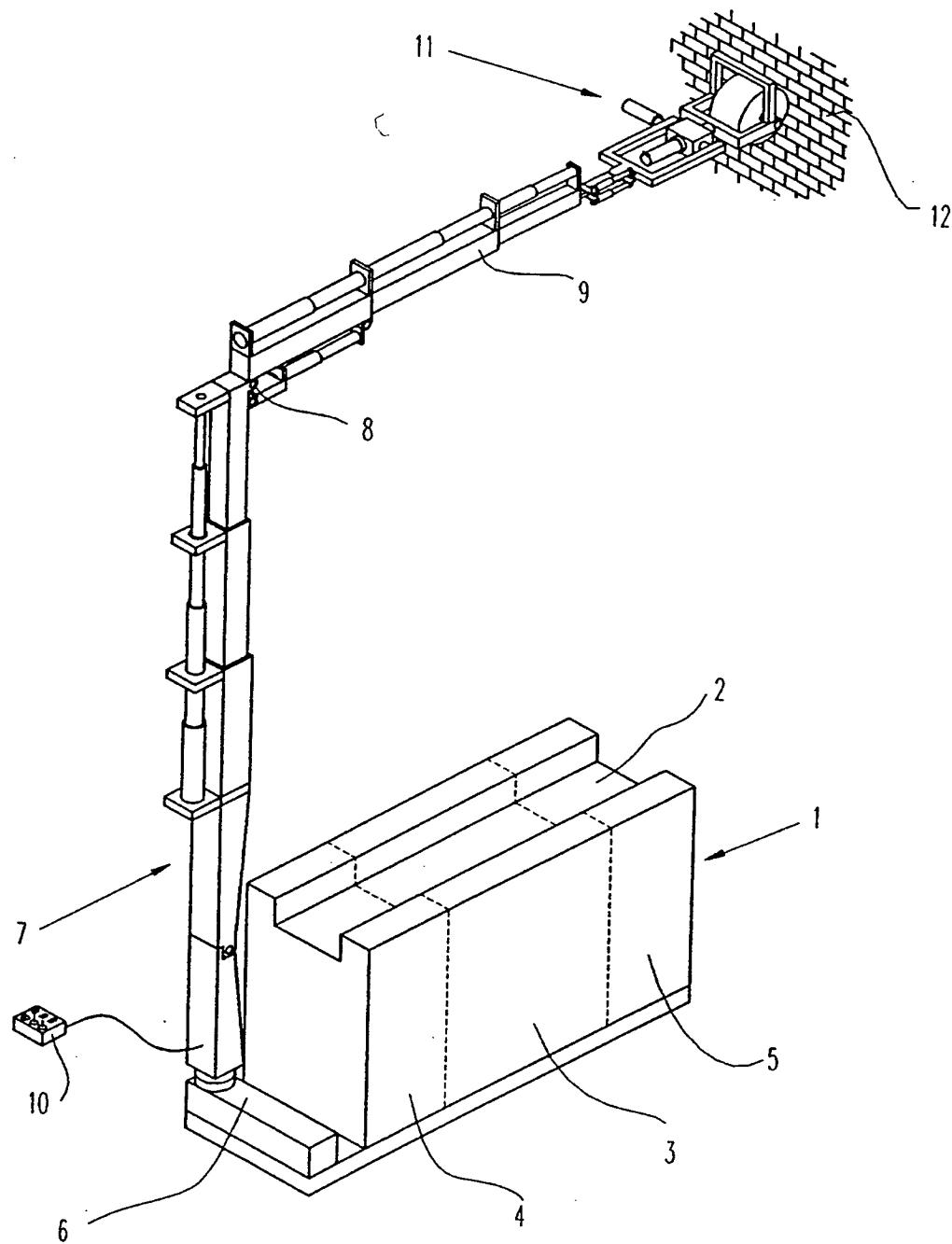


Fig. 1.

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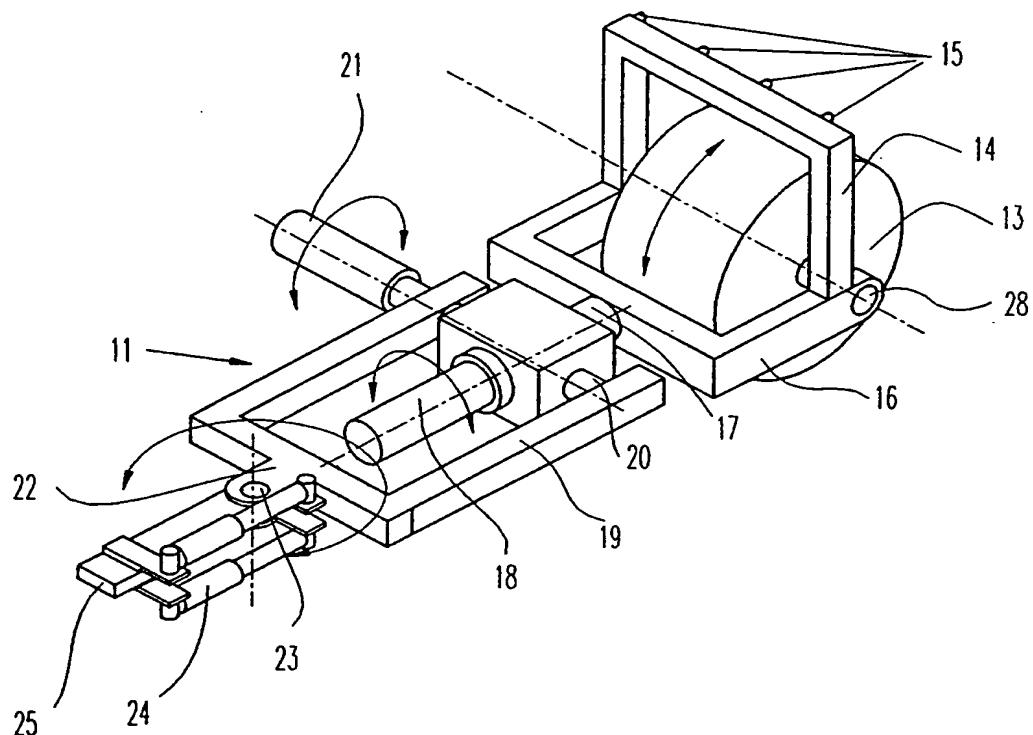


Fig. 2.

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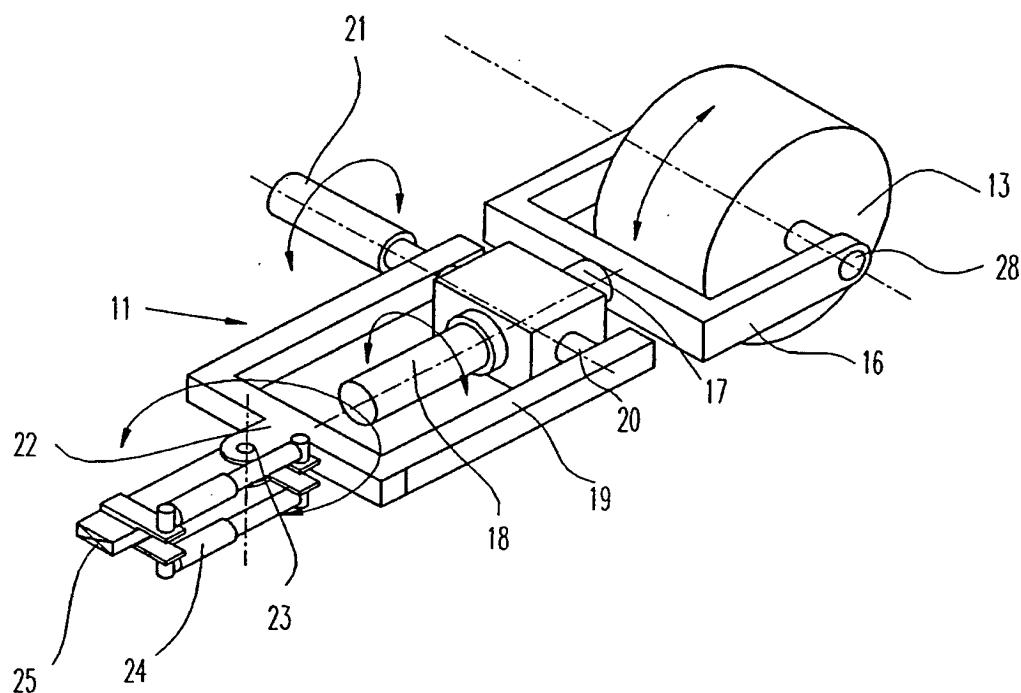


Fig. 3.

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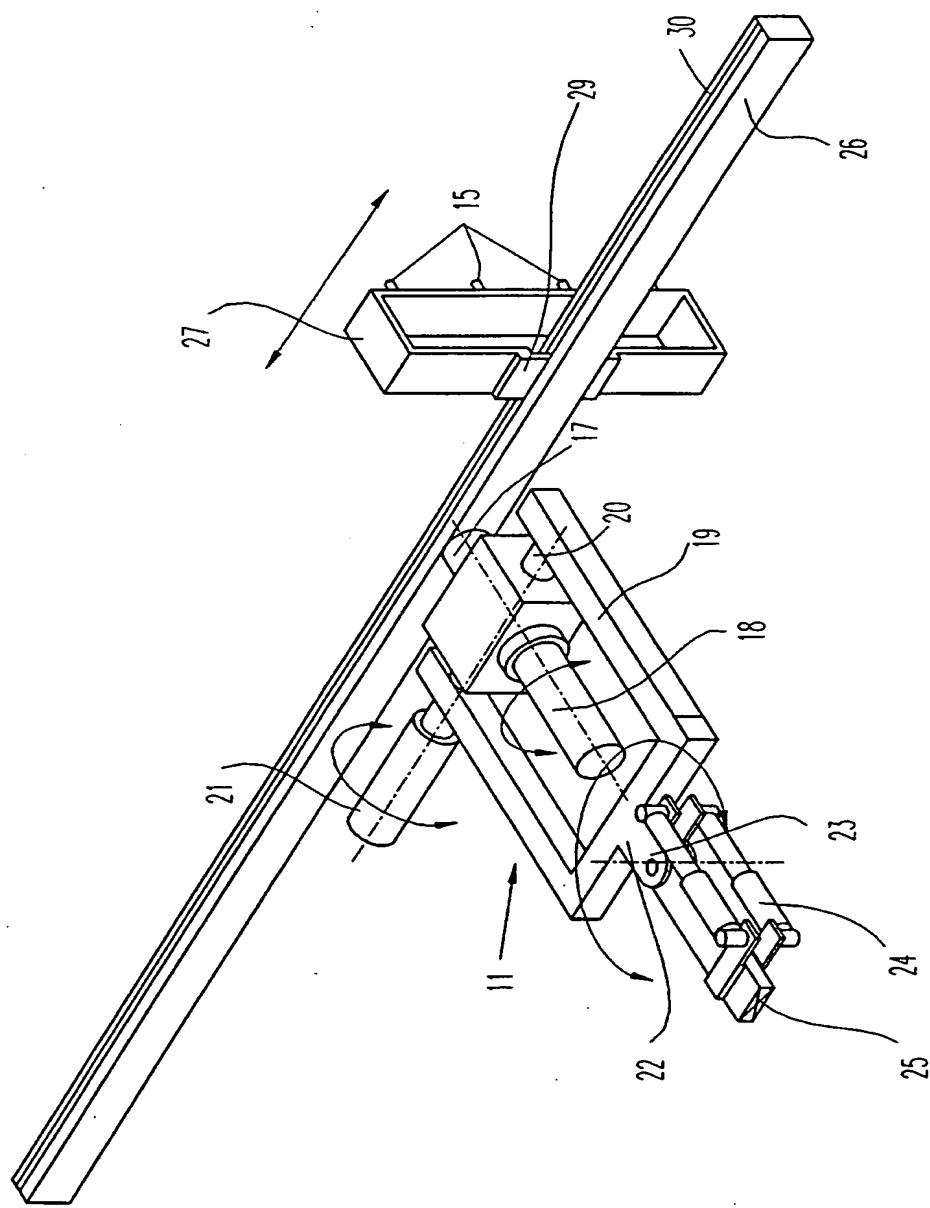


Fig. 4.

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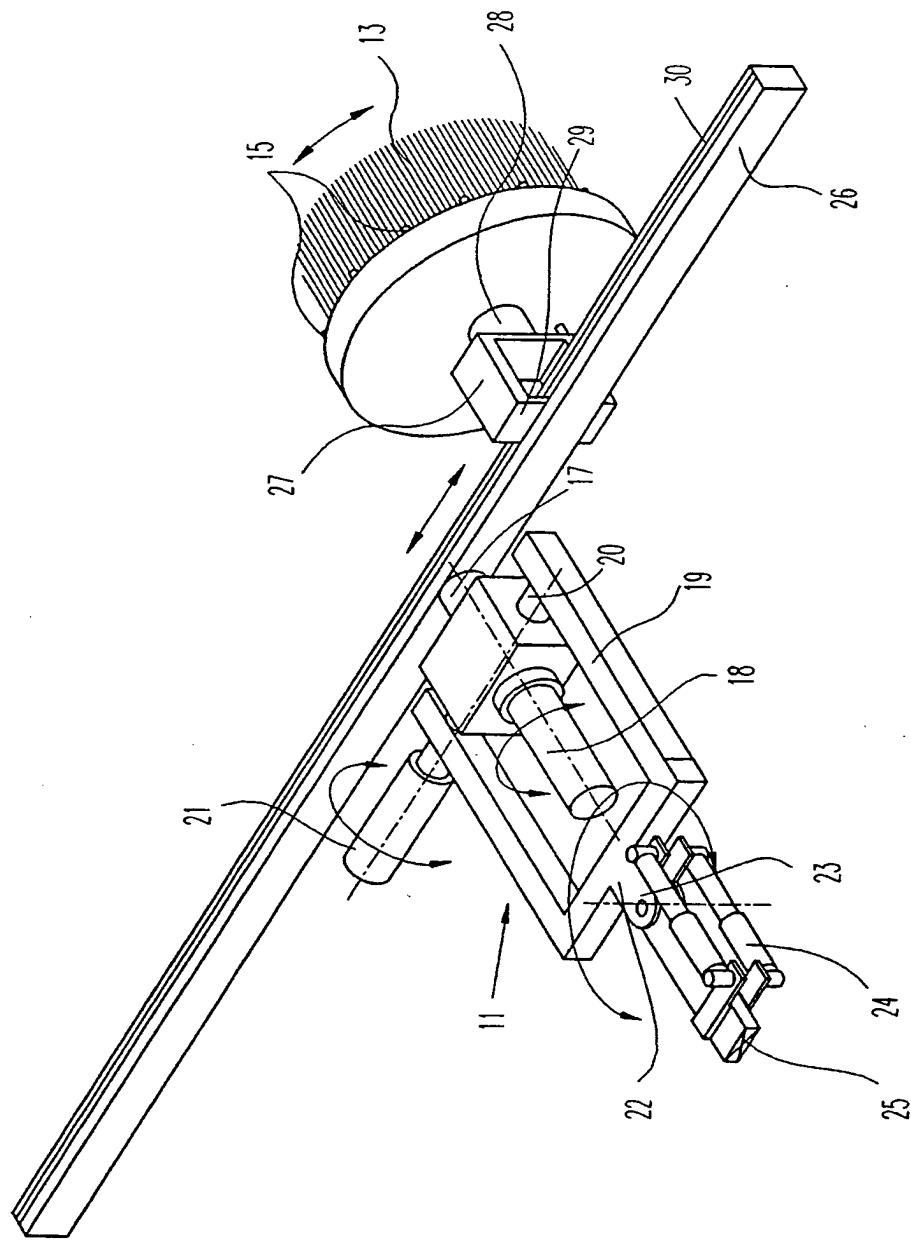
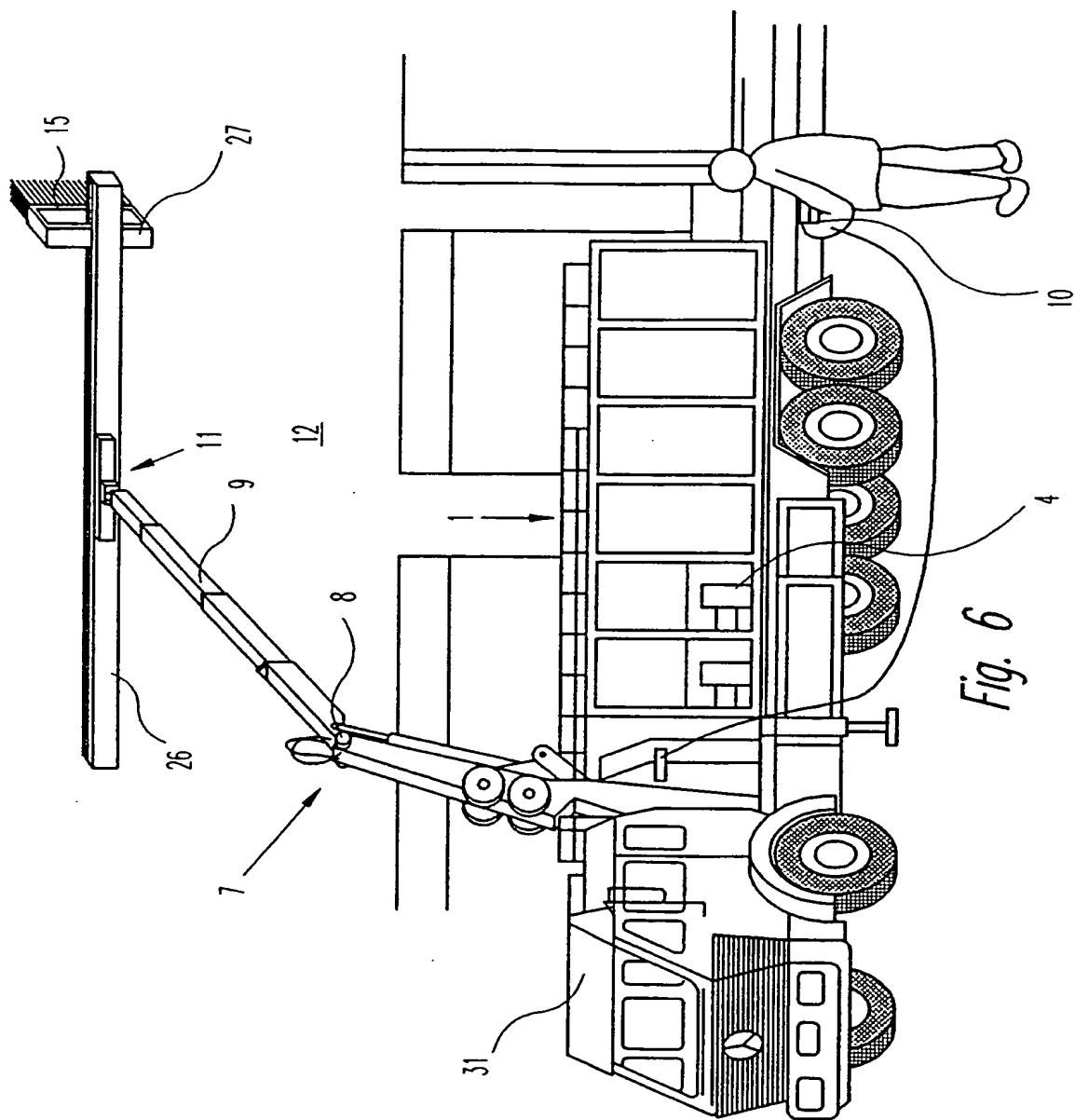


Fig. 5

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 94/00296

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: E04G 23/00 // E01H 1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: E04G, E01H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR, A1, 2674559 (ONET (S.A.)), 2 October 1992 (02.10.92), page 5, line 28 - page 6, line 18, abstract --	1-4
X	DE, A, 2254525 (MAYER, K.M.), 9 May 1974 (09.05.74), claims 1-2,5-6,51, 54 -----	1-4

 Further documents are listed in the continuation of Box C. See patent family annex.

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Date of the actual completion of the international search

1 November 1994

Date of mailing of the international search report

09-11-1994

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INTERNATIONAL SEARCH REPORT
Information on patent family members

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International application No.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A1- 2674559	02/10/92	NONE	
DE-A- 2254525	09/05/74	NONE	

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